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AGRICULTURAL JOURNAL

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So many requests are received from abroad for parts of the *Agricultural Journal* which were never published that the following list of all issues published and those which are not now available is given for reference. Attention is especially directed to Volume 7 which had only one part :—

Vol.

1. 3 numbers, 1928.
2. 4 ,, 1929.
3. 3 ,, 1930. (None).
4. 4 ,, 1931.
5. 2 ,, 1932. (None of No. 2).
6. 2 numbers, 1933.
7. 1 number, 1934.
8. 4 numbers, 1935-37 (None of No. 4).
9. 4 numbers, 1938 (None of Nos. 2 and 3).
10. 4 numbers, 1939 (None of Nos. 2 and 4).
11. 4 numbers, 1940. (None).
12. 4 ,, 1941 (None of Nos. 1 and 2).
13. 4 numbers, 1942.
14. 4 ,, 1943.
15. 4 ,, 1944.
16. 4 ,, 1945.

ISSUES OF THE AGRICULTURAL CIRCULAR.

NUMBERS and year of issue of the *Agricultural Circular*:—

Vol. 1, 1920, 12 numbers.
,, 2, 1921, 5 ,,
,, 3, 1922, 4 ,,
Vol. 4, 1923, 1 number.
,, 5, 1924–5, 2 numbers.

As number 4 of Vol. 3 was printed as " Volume 4 " and number 1 of Vol. 4 as " Volume 5 " it would appear from an inspection of a complete set that Volume 4 comprised only a number 4 and that there were two issues of Volume 5, No. 1.

ANNUAL BULLETINS.

THE Annual Bulletin of Divisional Reports ran from 1931 to 1938 and was then discontinued.

OLD ISSUES OF AGRICULTURAL BULLETINS.

FREE copies of the following Bulletins are available to Colonial Departments of Agriculture, research institutes and bona fide planters, etc.:—

No. 1. Sisal Hemp in Fiji, 1911.
3. Rhinoceros Beetle in Samoa, 1912.
4. The Banana in Fiji, 1912.
5. Scale Insect on Bananas, 1913.
6. Lemon Grass, 1913.
7. A Mission to Java for a Coleopterous Pest of Bananas, 1914.
8. Coconut Experiments, 1915.
9. Soils of Fiji—I., 1916.
11. Alluvial Soils of Fiji, 1919.
12. Leaf Moth of Coconuts, 1919.
13. Sea Island Cotton, 1920.
14. Transparent Coconut Scale, 1921.
15. Purple Leaf Moth of Coconuts, 1924.
17. Early Nutfall in Coconuts, 1930.
18. Control of Coconut Spike Moth, 1935.
19. Fruit Fly Investigations, 1936.
21. Biological Control of the Rhinoceros Beetle, 1941. Price 1s.
22. An Introduction to the Mosquitoes of Fiji, 1943.
Fijian Plant Names, 1942. Price 3s. 6d., 4s. and 6s.

Applications should be made to the Librarian, Department of Agriculture, Suva, Fiji.

—EDITOR.

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AGRICULTURAL JOURNAL

ISSUED BY THE

DEPARTMENT OF AGRICULTURE, FIJI.

VOL. 17.] DECEMBER, 1946. [NO. 4

EDITORIAL.

PLANT PROTECTION SERVICES.

IN recent years great advances have been achieved in the application of scientific principles to the control of plant pests and diseases and to the reduction of the many biological problems of agriculture and horticulture. Every farmer and gardener is well aware of the losses incurred, not only by plant pathogens of various kinds which attack and destroy growing plants, but also by those brought about by the competitive growth of weeds in field and garden.

The spread of plant diseases and weeds from one area to another and from one country to another has been due almost entirely to human agency and there is now no country where scientific plant protection services are unnecessary.

Fortunately, scientific research has provided many invaluable aids in the way of efficient fungicides, insecticides and weedicides and in the production by breeding of resistant varieties of garden and crop plants: but the preventive methods of plant sanitation, the control of plant introduction by means of careful inspection and quarantine are still of the greatest importance.

A new danger has arisen in recent times. With the rapid development of air transport services there has come an increased danger of the importation of plant diseases, pests and weeds; and the necessity of adequate plant protection services is everywhere being stressed. Fiji, placed at the cross-roads of Pacific air and surface communications is in a most vulnerable position, being liable to receive unwelcome importations from a number of directions. The neighbouring Dominions of Australia and New Zealand and the Pacific territories of the U.S.A. have well established inspection and quarantine services enabling an efficient control to be exercised. Local collaboration with these services has become a matter of immediate concern.

To this end the plant protection services of the Department of Agriculture have recently been reviewed and reorganized, firstly to provide more efficient working of the Regulations and secondly to assist the farmer and the gardener directly with the control of pests and diseases in the field.

An attempt is being made to keep the general public fully informed on the subject. Several information bulletins have been issued dealing with the requirements of the Regulations under the Noxious Weeds and Diseases of Plants Ordinance, so far as the importation of plant material is concerned.

In the interests of local agriculture, protection against the introduction (whether wilful or accidental) of undesirable plant material is a matter of common sense and one in which the Department can justly expect the full co-operation of the travelling public, local import firms, farmers and gardeners. That this is not always available is due partly to a genuine ignorance of the requirements but also, in some cases, to deliberate avoidance of them.

It is hoped in this connexion to develop an adequate quarantine service for certain classes of plant material; and provision has now been made for the installation at the Suva wharf of an incinerator to facilitate the destruction of undesirable material which may reach the Colony.

If we are concerned with the necessity for adequate inspection and quarantine of imported plant material we also owe a duty to neighbouring countries to which plants of Fiji origin are consigned or taken. To meet this need and to reciprocate with overseas arrangements, standard plant health certification has been reorganized and will be carried out on lines acceptable to those countries.

The services provided by the Department are available free of charge save in cases where fumigation or disinfection may be necessary and it is hoped that residents of the Colony will co-operate fully with the arrangements for a suitable service based upon mutual confidence and reliability.

Internally, certain advances have been made to improve the measure of assistance available to local residents in the way of plant pest and disease control. Sanction has been granted for the maintenance of a plant protection service involving the provision of material and equipment for use in gardens and on farms in such cases where these are not otherwise available. In this way the advisory services of the Department are strengthened by practical direct assistance in the field; the methods and efficacy of treatment demonstrated on the spot; and, it is hoped, a gradual improvement achieved in the general practice of plant sanitation throughout the Colony.

The need for adequate plant protection services and a firm administration of the Regulations is only too obvious in view of the serious weed position that now exists in the Colony. The Department of Agriculture cannot safeguard the primary industries of the Colony without the active support of the public whose co-operation is cordially invited. —B.E.V.P.

PLANT DISTRIBUTION.

DURING November approval was granted for a free issue of budded citrus trees to all who wished to avail themselves of the opportunity by applying to Departmental stations at Suva, Labasa, Naduruloulou, Dobuilevu (Ra), Ba and Sigatoka: as a result of the publicity given to this issue a total of 812 trees were supplied as follows:—Grapefruit, 153; Oranges, 387; Mandarins, 109; Lisbon Lemons, 79; Seedless Limes, 84.

In addition, during the year a total of 360 trees have been supplied free to Government institutions, schools and hospitals.

Wide interest has been stimulated by the free issue of these trees and a considerable demand has been developed. These are available at 1s. each.

A NOTE ON THE POSSIBILITIES OF THE BEEF INDUSTRY IN FIJI.

By H. T. B. HALL, B.V.Sc., Acting Senior Veterinary Officer.

It has been recognized for many years that animal protein in the diet of the various races of Fiji has not been sufficient for optimal requirements. This is not peculiar to Fiji but may be found in many countries, particularly in this post war period, when food shortages of all sorts have been most pronounced.

It must be understood that, to meet the nutritional requirements of the human body, the diet must contain protein, carbohydrate and fat as well as minerals, vitamins and water, and as far as human beings are concerned, animal protein forms a very important section of the normal protein intake. In Fiji, meat is a convenient form of animal protein and the production of beef is a well organized industry which forms part of the agricultural economy of the country.

As an indication of the development of the beef industry it is of interest to note that, apart from a period during the war when overseas troops were stationed in Fiji, the Colony was able to support its own fresh beef requirements. In 1945 the number of animals killed in registered slaughterhouses was 6,373. This is a marked increase over previous years, except for the years 1941 and 1942 when army requirements had also to be met, and it is logical to assume that this trend will continue in the future. Total killings in registered slaughter-houses since 1939 are as follows:—

1939	4,294	1943	5,240
1940	4,315	1944	4,329
1941	7,052	1945	6,373
1942	8,051		

At the present time the supply is a little in excess of demand, not because more beef consumption is not necessary but because a large section of the community cannot afford to buy more. This, with sound planning, will in due course be suitably adjusted.

Of the beef supplied to local markets, less than half is obtained from pastoralists whose main pursuit is the production of good quality beef. The remainder is obtained from dairy farmers, planters, or peasant farmers, all of whom can and do grow cattle surplus to or unsuitable for their own requirements. It is obvious that beef from these latter sources, not having been grown specifically as beef, will be inferior in quality to that obtained from specific beef breeders, whose animals are especially bred, fed, and managed with the object of producing a good type of carcase beast.

In most well-developed countries, the difference in quality is allowed for by the organization of a system of grading, which is carried out at the abattoirs by the meat inspectors, who examine and mark each carcase according to its quality with a special device which marks each cut on the carcase with an indelible ink. The colour of the ink differs according to the quality of the carcase. Prices are graded according to quality and consequently retail purchasers of beef can choose a cut, the quality of which is commensurate with their pockets or their particular requirements. Such a system has distinct advantages to producer, butcher and consumer, the producer because he is paid according to quality, the butcher because he can select according to the requirements of his own trade and the consumer because he can be assured of getting value for money.

The breeding of beef cattle is a very different thing to the breeding of dairy cattle. Beef cattle differ markedly from dairy cattle in the way they grow. In the latter the capacity for muscle and fat growth is much less developed. In breeds specially selected for beef, surplus nutrition is directed not to milk-production, but to the growth of flesh (muscle and fat). This results in the typical blocky form produced by a deep, well-developed cover of flesh over the bones in a beef animal in contrast to the dairy type, which is lean and angular due to sparseness of flesh and fat.

The modern requirements for beef are for a small carcase which has been quickly grown. Some parts of the carcase (back and hind quarters) are more valuable than others (shins, neck and brisket). The rate and extent of growth of these different parts determines the suitability of an animal for beef. In the improved and quick-maturing beef breeds like the Aberdeen-Angus, Shorthorn and Hereford, the breeder has developed cattle which at an early age have a carcase with a very high proportion of the most valuable late-developing parts of the body, such as the back and hind-quarters. Even in these breeds, however, the low-priced fore-end will develop in advance of the high-priced hind-quarters if the animals take too long to grow to killing weight. In the Argentine cattle can grow to produce a 600 lb carcase in two years. In Fiji it takes four years and at four years of age the beast has a very heavy (mature) chest and neck, with a very light hind-quarters giving it an appearance not unlike that of a lion rather than a beef steer. The carcase may, at four years of age, tip the scales at more than 600 lb perhaps 700 or 800 lb, but the low priced fore-end cuts still form the bulk of the carcase.

Breeding for beef, then, consists in rearing animals on as high a plane of nutrition as possible and selecting for breeding those animals most closely approaching the typical blocky form and which go through the growth changes most quickly. The animal with shorter thicker bones will have a greater depth of flesh and more blocky joints.

Let us consider the application of these principles to the growing of cattle for beef in Fiji. It is clear that there is a market for first grade beef as well as a market for second grade, and therefore it would be in the interests of the industry if a number of producers shaped their breeding policy to fill this market. There are already two breeders in the Colony interested in the Aberdeen-Angus breed, and one of them in particular is taking great care to see that he keeps his stock pure-breed. Aberdeen-Angus cattle are famous the world over for their beef-producing qualities, but no clear evidence is yet available that they are the ideal beef breed for the tropics generally or for this Colony in particular. It may be that the Hereford or the Shorthorn, because of their more efficient heat regulating mechanism, may prove to be more suitable in the long run, but there is no reason why we should wait for the result of long term experiments on these breeds, or their crosses with Zebu blood, before commencing beef breeding. We know from past experience that these British breeds do reasonably well in Fiji provided they are adequately fed. In fact there is at present in the Colony a large herd of Herefords which has been run on sound lines for many years.

Dairy farmers and peasant farmers whose interest in beef production is secondary to their interest in milk production or work animals will sometimes produce a steer, surplus to their own requirements, which is by no means second-rate as a carcase beast and it is no doubt reasonable for them to expect top price for such an animal. On the other hand, cull-cows from the dairying industry or old working bullocks can only be considered as second-grade beef and it should be reasonable to expect a lower price.

There is now an ideal opportunity for copra-planters to enter the industry, using good quality beef stock in association with their copra estates. In years past this has been a recognized and lucrative practice on islands such as Taveuni. Owing to the pre-war difficulties of the copra industry, followed by the war period when labour and wire was short, the beef producing activities on such islands were so restricted and herd maintenance so deteriorated that the re-establishment of the old herds is now practically impossible. With the future probability of a better organization of the beef industry and the enlargement of the beef-eating population, there is a distinct opportunity for planters as well as others to commence now to establish good quality herds either as a side line or as their main activity.

EXTRACTS.

BRACKEN DEFIES METHOXONE.

A DRESSING of C.L.C. (Methoxone) has been tested in Yorkshire as a means for eradicating bracken, but with little success.

The dressing was a four per cent powder applied at the rate of between one to three cwt. an acre, which, though having little effect on the bracken in the year of application, brought about malformation in the fully grown plant.

Sodium chlorate was also tested for this purpose, and caused a complete kill of all the surface bracken and slightly damaged the shoots and rhizomes below ground. A mixture of sodium chlorate and calcium chloride is suggested in place of sodium chlorate.

—"Manufacturing Chemist"—Vol. XVII, No. 4, p. 173, April 1946.

FUMIGATION BY BURNING DDT.

EXPERIMENTS with the burning of filter papers impregnated with DDT for fumigating cow sheds and stables, etc., have been described by Dr. M. Cohen, of the Association of Applied Biologists. The smoke produced a deposit poisonous to lice and stable flies for up to 16 days.

In another experiment DDT was heated just above its melting point for several hours in a glasshouse, and was found to kill flies, aphids and caterpillars.

—"Manufacturing Chemist"—Vol. XVII, No. 4, p. 173, April 1946.

DDT SPRAY HARMLESS TO MAN.

AFTER drastic exposure tests with DDT two officers of the naval School of Tropical Hygiene claim that it has no ill-effect on man (*Nature*, 1946, No. 3994, p. 658). Sinhalese working under their direction in tropical conditions at Colombo soon discarded all protective clothing while spraying a five per cent solution of DDT in grade 2 paraffin. Spraying was often performed in a confined space, which resulted in a saturated atmosphere, and many of the spraying devices leaked. At the end of a day the men were covered with a white frost of DDT, while overalls were frequently saturated.

Liver function and hæmoglobin estimation, red and white cell counts, and urine and stool analysis were made for these men and for some control Sinhalese of comparable age. As a result of these investigations and observation of the men at work Stammers and Whitfield concluded that the DDT spray was wholly innocuous.

—"Manufacturing Chemist"—Vol. XVII, No. 7, p. 293, July 1946.

FIJI AND THE FOOD AND AGRICULTURAL ORGANIZATION.

By B. E. V. PARHAM, M.A., Senior Agricultural Officer.

The General Position.

The Food and Agricultural Organization established by the United Nations to investigate, establish and control the production, distribution and consumption of the world's food supplies must have a call on the thoughts and interest of all classes of people in all parts of the world. In order that we can establish and sustain our small share of responsibility it is necessary to know something about the problem as well as about the contribution the Colony is making or could make towards alleviating the world food shortage.

In recent reports the position for 1946/47 has been stated in terms of wheat to involve an anticipated gap of ten million tons necessitating an enforced economy in the consumption of grains during the year.

The following measures have been recommended by the organization.

(1) Animal Production—
- (*a*) curtail the use of wheat and other grain for the feeding of animals;
- (*b*) maximum use of pastures;
- (*c*) avoidance of waste due to inefficient feeding;
- (*d*) priority to be given to dairy cows producing fresh milk.

(2) Grain—
- (*a*) rice should be milled as lightly as possible;
- (*b*) the industrial use of grains should be curtailed;
- (*c*) the human use of grain should be regulated and restricted and wheat flour supplemented.

(3) Control of waste is imperative—
- (*a*) on the farm;
- (*b*) in food stores due to rats, mice, insects, moulds, etc.;
- (*c*) waste by consumers in homes and public eating houses.

With reference to peanuts and pulses it has been proposed to divert these from livestock to human consumption, to convert soya bean and peanut cake for human use and to encourage their use in bread.

Economy in the use of sugar is necessary by means of reduced use in homes and industry and by developing wider uses of molasses.

To stimulate the production of rice which is the staple food of vast numbers of people it has been suggested that consumer goods must be made available in producing countries also agricultural implements, pumping plants and spare parts.

With regard to agricultural supplies, it is recognized that mere extension of acreage will not secure maximum production unless provision is made of materials (fertilizers, etc.), to ensure the greatest yields per acre. To this end adequate supplies of implements, tractors, pesticides and fertilizers are being arranged with priority of transport and priority of application to the production of essential foodstuffs. Co-operation in the supply of agricultural seeds is also being organized. The anticipated shortage of fats in 1947/48 necessitates stimulation of the production of oil seeds, cotton seed and other similar crops, and of dairy products, meat and eggs.

Finally, of fundamental interest to the primary producer is the decision to study the problem of agricultural surpluses and the international aspects of price policies so that producers may be ensured of fair treatment now and in the future.

Local Food Supplies.

Having summarized above the general position and the principles laid down by the Food and Agricultural Organization, it is possible to review briefly the present position in the Colony as regards the production of food for local use or export and of potential export crops.

1. *Sugar.*—Production for export is receiving maximum attention—fertilizers necessary for the increasing of yields are becoming available and greater use is being made of molasses as a stock and poultry food. It would appear that Fiji can contribute little by reducing the home consumption of sugar; and waste is not excessive either in the home, in stores, or in local subsidiary industry. Production this year (1946) was about 116,000 tons; for 1947 it is anticipated that it may reach about 125,000 tons if conditions are satisfactory.

2. *Copra.*—Price increases have stimulated production in all areas and this is reaching the maximum (estimated 30,000 tons). There is, however, considerable scope for technical improvements in drying equipment; and field practice (weeding, draining and manuring) leaves much to be desired. During the present period of good prices, effective action should be taken to improve conditions, especially in Fijian areas where some form of co-operation is essential in order to maintain minimum requirements for good drying. There is much waste in the processing and handling of this product especially that due to ravages of rats, insects and fungi, losses which probably amount to a total of 3,000 tons worth £70,000 anually(1).

The coconut industry is making a substantial contribution to the overseas food shortage not only in terms of corpa and oil exported but also in the way of coconut meal which is in demand for supplementary stock food in New Zealand. The export of this latter commodity is expected to reach 5,000 tons in 1947.

3. *Bananas.*—The production of fresh fruit for export is estimated to provide 87,000 cases in 1946. The total area devoted to this crop is much smaller than it could be; but some recent replanting has been recorded in one or two areas, viz. Nadroga, Serua, Navua, Tailevu. Elsewhere provincial planting programmes are in arrears and some districts have ceased to produce any bananas for export. There is a pressing need for new plantings of selected plants—for reasonable field sanitation and pest and disease control and improved handling—all of which is well within the capacity of the present growers. The current neglect of simple methods for the control of virus, bunchy top and the leafspot diseases of bananas represents a very dangerous policy for so important a cash crop. Handling, packing and transport practices call for considerable improvement in order to eliminate waste. The shortage of timber for cases is a factor which to a large extent affects the export potential of this crop.

The dehydration of bananas has recently received attention and stimulated some interest. The Department has been fortunate to secure the co-operation of the Fruit Research Officer, Department of Scientific and Industrial Research, New Zealand, who is conducting investigations into the economic processing of bananas. Markets are not certain but the product, so far as is known, would be acceptable overseas for some time to come and the development of the industry would be extremely useful.

Other banana products (chips and flour) call for investigation.

4. *Peanuts.*—The production of peanuts for export has greatly increased during the present year and will, it is estimated, reach a total of 4,000 bags (= 266 tons) as compared with 60 bags (= 4 tons) exported in 1945. Some oil is being expressed locally and is available for export at the comparatively high price of 22s. 6d. per gallon in 44 gallon drums. Present production is due to the high price (9d. per lb f.o.b. Suva) which has stimulated growers and in some cases led to unprofitable cultivation in unsuitable soils and seasons. The value of Fiji's contribution in respect of peanuts is difficult to define—all consignments going to New Zealand.

5. *Soya Bean.*—Production of this useful pulse and fodder crop has been practically limited to agricultural stations—a very few farmers have attempted to grow it. Seed of an excellent variety is available and the crop could be increased if a steady market can be found. Local trials have been made by a commercial concern to utilize soya bean meal in the place of flour. Results have been useful; but the price offered (3½d. per lb) is likely to prove unattractive to the growers who are somewhat dubious about a crop new to their experience. Yields locally are variable but under optimum conditions up to 1,500 lb (25 bushels) per acre have been obtained. This crop can at present contribute but in a very small degree to local food supply: but trials for fodder purposes are in hand at Navua and elsewhere.

6. *Pulses.*—Production of dhall, mungh and other pulses is somewhat local and generally insufficient for the Colony's needs. The crop is rather in competition with sugar in some districts but grows on poorer soil than the former and crops could be increased in Ba, Ra and Macuata. Prices are high (6d. to 9d. per lb). It seems desirable that growers should be protected by some kind of price stabilization as it should not be necessary to import pulses into the Colony. In order to increase production seed supplies of improved varieties are necessary. Limited quantities of seed of improved strains of pigeon pea and grain are available and stocks are being built up for distribution.

7. *Rice.*—The total estimated production (17,000 tons) is probably optimistic but is almost sufficient for all local needs. Current restrictions on the consumption of rice by Europeans and Fijians probably involves a saving of some 500 tons. In terms of the F.A.O. recommendations the use of rice for feeding of animals (poultry and dogs) in the Colony deserves consideration.

Production of rice is not at maximum due to several factors among which may be listed—

(1) inadequacies in land tenure and control of drainage;
(2) crop losses due to (*a*) weeds, (*b*) poor varieties, (*c*) poor cultivation practices;
(3) competition with sugar cultivation in terms of manpower and land;
(4) much good accessible rice land is not fully developed.

With regard to the approaching crop (1946/47) an increase in total area of some 500 acres is anticipated in Vanua Levu. In Viti Levu prospects are good except in parts of the dry districts and increases are indicated in some areas in Tailevu and Ra.

The Department is actively concerned in the matter by means of (1) propaganda, (2) seed distribution, (3) seed cleaning, (4) pest control, (5) tractor ploughing to break in new land. Of the above, seed cleaning may not be fully effective this year owing to staff difficulties and technical problems of power and transport but a start is being made. In practice it has been

found that growers are not keen to have padi seed cleaned on account of the cost of transporting it to the cleaning centres. Careful organization will therefore be necessary and possibly some form of seed certification and control especially in the event of the weed muraina grass being proclaimed under the Regulations of the Noxious Weeds Ordinance.

The Colony is making a small contribution to overseas food production by exporting rice bran to New Zealand as a supplementary stock food. For 1946 a total of 147 tons has been made available for this purpose: and there is considerably less waste of this material now than formerly.

There is no control of milling which would contribute any saving of this food but there is apparently little waste in this direction. Developments in the way of improved implements, irrigation and water control and manurial practice are long overdue and would result in considerable increases in the productivity of the existing areas devoted to rice cultivation.

8. *Grain Sorghums.*—The production of grain sorghums and other cereal crops such as adlay is at present insignificant. In view of the excellent food value of these grains, particularly for stock food, arrangements are being made to encourage the cultivation of selected varieties by making seed available to small holders.

9. *Maize.*—There has been a considerable falling off in production due to—

(*a*) competitive prices for peanuts;
(*b*) weather conditions in the dry districts;
(*c*) lack of fertilizers resulting in poor and disappointing yields which discourage the small farmer;
(*d*) spread of downy mildew disease in wet zone areas necessitating that cultivation of maize near sugar cane be discouraged, a circumstance which incidentally has resulted in the greater use of padi for stock feed in some districts;
(*e*) lack of storage, marketing and drying facilities. The shortage of maize for local use has been marked and prices have soared to 42s. per bag (£23 10s. per ton) during the year.

This crop can be increased by adequate supplies of good seed, reasonable supplies of fertilizers, gauranteed prices and purchases, provision of facilities for drying and storage. Proposals are under consideration with the objective of ensuring regular and adequate supplies of this grain all the year round.

There is a limited use of maize meal as a supplementary cereal in the diet of Indian farmers and their families; but otherwise the main demand is for poultry and stock feed.

10. *Tapioca and other starch foods.*—Production for local consumption is adequate and normal. Grated tapioca root (flour) and starch (arrowroot) is being produced on a small scale for export but efforts to obtain firm overseas markets are still without result. Increased plantings are reported and up to five tons of tapioca starch per month can be obtained without machinery. A trial shipment has been included in Food for Britain consignments.

Preliminary enquiries have been made regarding suitable plant for processing and the Fruit Research Officer of the New Zealand C.S.I.R. Department has undertaken to report on suitable drying equipment. Every assistance is being given in the way of exploration of markets which appear to be potentially important if production costs can be reduced.

11. *Sweet Potato.*—The export of fresh tubers to New Zealand is unfortunately now impossible on account of import Regulations but the flour and other dried products have a high food value and require further investigation. The starch variety " Winnop " has been introduced and is held in propagation plots and could be quickly increased.

12. *Cotton seed and other oils.*—Cotton is not now grown in the Colony and the prospects of reorganizing the industry are being investigated. Minimum stocks of seed are being held by the Department as the demand for lint, oil and by-products appears to justify the restoration of this crop which has been recommended as a useful one for rotational cropping in certain dry areas.

13. *Pineapples and other fruits.*—There has been some expansion of pineapple cultivation both for canning purposes and for export of fresh fruit. The latter will reach over 7,000 cases for 1946—and it is estimated that there will be a considerable increase in the tonnage canned during 1947.

The production of citrus for export is restricted on account of import and marketing controls in New Zealand: and there is no immediate prospect of any great expansion of citrus cultivation. The Department is actively engaged in the propagation and distribution of budded stock of the principal varieties for home use with a view to improving local supplies.

14. *Animal production.*—This has been referred to elsewhere in the present issue(2)—but some reference is necessary here to pasture improvement which represents a means of increasing food supplies in terms of butter fat and beef.

There has recently been some progress with the rehabilitation of pastures by means of weed clearing and this means several hundreds of acres of additional grazing being available. Some farmers have made considerable advances with the establishment of grass pastures, especially para grass in the wet zone and blue grass in the dry areas, and there has been some topdressing with coral sand. Few new dairy farms have been established in recent years but there have been quite recently several cases of considerable improvement in management and productivity on farms. Immediate possibilities are the improved supply of lime and fertilizers, drainage, development of fodder crops and improved pasture management involving subdivision and control of over-grazing. The current lack of fencing wire is a considerable handicap to immediate progress. The Department is actively engaged in the propagation of improved fodder plants and grasses—some seed and other material has been issued to farmers but facilities in the way of land and staff are temporarily inadequate for a rapid development of this important work.

The development of new roads and the steady improvement in farming practice now evident must in a comparatively short time greatly increase the present output of the dairy industry which is not sufficient to meet local demand. It is obvious that a maximum use is not being made of the available pastures of the Colony, many of which are urgently in need of renovation.

15. *Waste.*—There is considerable waste on plantations, on farms and in houses, not only in the course of handling of primary products but also in the consumption of foods both of local origin and from overseas. Reference has been made to losses associated with the drying of copra and the use of rice for stock food, but there are considerable losses in storage and transport due to improper handling, ravages of rats and insects, especially in the case of rice and pulses, and to inefficient feeding of livestock, poultry, pigs and cattle.

Summarizing the above notes it may be said that the Colony's contribution to the food problems overseas is direct and effective in the case of sugar and copra, indirect but effective to a large extent in regard to animal production, rice and principal root crops, and potentially effective in regard to bananas (and dried products), tapioca and sweet potato products, peanuts, pulses, maize and pineapples—all of which are immediately capable of considerable expansion with a corresponding reduction in imports as the least benefit. At present no effective contribution is evident in regard to production of cotton seed oil and soya bean or to the avoidance of waste.

REFERENCES.

(1) Blackie, W. J.—"Mould Damage in Copra", Vol. 3, No. 2, p. 72.

(2) Hall, H. T. B.—"A note on the Possibilities of the Beef Industry in Fiji", *Fiji Agricultural Journal*, Vol. 17, No. 4, p. 93.

REVIEW.

HYBRIDIZATION INCREASES YIELD AND VIGOUR OF CROP PLANTS.

In a recent Bulletin(1) published by the Imperial Bureau of Plant Breeding and Genetics, readers will find an interesting account of recent work on the exploitation of hybrid vigour in agricultural and horticultural crops. The value of this work may be illustrated by reference to maize, a crop which has been greatly improved in recent years by methods of inbreeding and controlled heterosis. It is stated that in 1933, of the total maize acreage in the corn belt of U.S.A., only ·2 per centum was planted to hybrid maize, in 1944, 82·5 per cent. Laubscher(2) estimates the contribution of hybrid seed to the American national economy by virtue of its increased yielding ability to be £500 million for the past four years. On the average, yield increases of about 20 per cent over those of standard varieties are obtained while the hybrids are much more resistant to drought and rot diseases, have stronger root systems and are much more uniform than the varieties commonly grown.

The bulletin under review is the first general publication covering the literature on the practical problems of hybrid vigour and provides valuable summaries of the most important work carried out in U.S.A. and elsewhere.

The crops are dealt with in four sections, self-pollinated plants, cross pollinated plants, asexually propagated plants and forest trees; and each crop is treated individually. A bibliography of 234 references is provided.

Crops of local interest dealt with are sorghum, rice, cotton, tobacco, capsicum, tomato, egg plant, maize, potato, sugar cane, cucurbits and other vegetables. —B.E.V.P.

(1) "The Use of Heterosis in the Production of Agricultural and Horticultural Crops" by T. Ashton.—Bull. Imp. Bureau of Plant Breeding and Genetics, School of Agric. Cambridge, July 1946, price 3s.

(2) F. X. Laubscher, Hybrid Maize Seed, Farming in S. Africa, Vol. 21, No. 246, 1946.

SCOURS IN CALVES.

By K. J. GARNETT, B.V.Sc., Veterinary Officer, Western.

ONE of the most disheartening aspects of dairy farming in Fiji is the high mortality experienced in calf rearing, and the stunted appearance of many of the survivors. Farmers claim that fresh blood is required and often go to the expense of importing a new bull, only to suffer the same disappointing results, for although a good bull is highly desirable in any herd, it is no use him siring good stock if the calves are to be reared as they are at present.

Scours and internal parasites, which may be bound up together in some cases, are responsible for most of the losses suffered in Fiji, and in this article it is proposed to use the classification of Messrs. Blood and Steel of Sydney University, which is based on an age susceptibility rather than the usual blood, white or grey scours.

Scours is essentially a condition of severe diarrhœa which is caused by a variety of organisms and in some cases by intestinal nematode worms. It should be noted that many varieties of bacteria are normally present in the alimentary canal of the calf to aid in digestion, but that under certain conditions these bacteria rapidly multiply and become far more virulent so that a condition of disease results.

Blood and Steel's classification is as follows:—

1. Calves up to two or three weeks usually have a light coloured and watery scour which is generally associated with organisms of the *Bacterium coli* group. Overfeeding and not feeding the "first milk" or colostrum are probably the main causes of this condition. It is most important that calves should be fed their dam's milk for at least five days after birth. Colostrum is not only valuable to the calf as a food, but contains substances not found, or found only in very greatly reduced quantities, in the milk some weeks later. Most important of these substances are antibodies which combat the disease forming bacteria and which protect the calf until it is old enough to produce them for itself. Vitamin A in which colostrum is also rich, is essential for the growth of the mucous membrane lining the wall of the intestinal tract. Mucous membranes, if healthy, are a strong barrier to the passage of bacteria from the gut into the blood stream which results in septicæmia, and many farmers would be well advised to feed fish oils to new calves to augment its supply. Colostrum, unlike the milk which follows, is rich in iron which is an essential component in the blood formation of the new calf. Ordinary milk contains practically no iron so that the calf is entirely dependent on the amount it has stored in its body until it starts to eat grass.

Bacterium coli is one of the organisms normally found in the alimentary canal, and some of the reasons for the sudden increase in virulence are as follows:—

(*a*) *Diet.*—Not feeding colostrum, feeding it when cold and clotted, or feeding too much of it and so causing a digestive upset, or feeding from dirty utensils. A common practice is to feed the milk from all freshly calved cows to the calves until it is fit for human consumption, and in small herds where several cows calve together this may result in the diet of the calves being suddenly changed from one of nearly pure milk back to one of nearly pure colostrum. Calves are very susceptible to changes in the composition of their diet and the sudden change above might well upset a calf one or two weeks old which has been getting fresh milk after the first few days of colostrum.

(*b*) Faulty pens with poor ventilation and cold wet concrete floors will result in chilling which will lower resistance as also will wet muddy yards. These conditions are ideal for the growth and multiplication of the disease organisms.

(*c*) Intra-uterine infection, or the infection of the umbilicus shortly after birth may result in a weak and sickly calf, and in some cases the painting of the "navel" with weak iodine shortly after birth has been found to be useful.

2. Calves about four to six weeks usually become infected because of faulty feeding. Various organisms may be involved including *Bacterium coli* and there is often a mixture of these organisms. Calves reared on their mothers are seldom infected in this group, and the main causes appear to be overfeeding, feeding at too long intervals, feeding cold milk especially when it is of a high fat content, or feeding from dirty tins or buckets. Calves at this age are also starting to pick at grass so that, combined with other factors, this may cause digestive upsets which will give the organisms a chance to establish themselves. The scour is usually black, brown or grey.

3. At six to eight months scours are not usually so common, and if present are mostly caused by a bacterial organism of the *Salmonella* or Paratyphoid group. These organisms often give rise to a co-existing pneumonia and the scour is usually almost black because of the blood in it. Salmonellæ are not usually present in the animal, so that their introduction must be prevented by rigid hygiene at all times, and their spread controlled by prompt isolation, removal of non-infected calves to a clean paddock, and the thorough boiling and cleansing of all feeding utensils. Calves which have been bought from neighbouring farmers may be the cause of an outbreak in this as well as other forms of scours so that care should be taken in this regard.

4. At about nine to 18 months, scours are usually due to the irritation set up by various types of Nematode worms of which *Hæmonchus*, *Nematodirus* and *Cooperia* species are the most common offenders. These worms are probably the cause of many outbreaks in far younger calves in Fiji. Prevention is by regular dosing with one of the more reliable anthelmintics such as phenothiazine, and the regular rotation of the calf paddocks in order to keep down the number of larvæ which hatch from the eggs deposited in the dung of the animals.

A more or less specific calf dysentery occurs at about the same age and is caused by a coccidia of the *Eimeria* species. In both the above, the scour is dark in colour because of the blood in it and in the case of the coccidia, which is located in the large intestine, the blood will often be seen in the form of bright red clots on the outside of the stool and as scouring becomes more severe almost whole blood may be passed. Control of Coccidiosis is difficult as adult cows may act as "carriers" without showing any symptoms themselves, and for this reason calves should not be run with adult stock. Treatment of Coccidiosis is not entirely satisfactory, but Sulphaguanidine is of some benefit.

The causes of the outbreaks of the various types of scours have been dealt with, but, in general, can be summed up by—

(*a*) *Faulty feeding.*—Each calf should receive colostrum from its mother for five days and at one or two weeks should not be suddenly changed back on to the colostrum from another freshly calved cow. All milk should be fed at blood heat and each calf should get its share of milk and no more.

Odd bits of decaying grass and vegetable matter and rubbish such as old rags, paint tins, etc., should be removed from the calf yard.

(*b*) *Dirty feeding utensils.*—These should be thoroughly cleaned with boiling water after use, and, although it is not always possible, it is highly desirable that each calf should have a separate feeding utensil. In any case, any calves showing the slightest sign of a digestive upset should be properly isolated and fed from separate utensils, or *after* the healthy calves have been fed.

(*c*) *Dirty and overcrowded pens and yards.*—Most farms in Fiji have dirty, wet, overcrowded pens and yards, and, all too frequently, these are situated below the milking yard so that parasite eggs, bacteria and coccidia from the adult and more resistant cows are washed down into the calf pens with disastrous results. Calves are kept in the same pens year after year and there is no subdivision or spelling of calf yards. The remedy is a light, airy shed with sufficient protection on the weather side. The shed and yards may be located near the dairy for convenience of feeding, but under no circumstances should they be lower than, or have any drainage from the dairy or adjoining yards passing through them, or be in a damp, ill drained position. Sufficient space should be allowed for four or more small paddocks for the calves, and they should be rotated around these paddocks for a week at a time. Most parasite eggs take nearly a week to hatch so that the calves will be moved to a fresh paddock before any really heavy concentration of larvæ is built up and in the three or more weeks that must elapse before that paddock is used again, many of the larvæ will have died unless favoured by wet, shade and dirt. Besides the benefit to the calves, it will be found that such a rotation will be of great benefit to the grass in the paddocks, and care should be taken when they are built that they are sufficiently large to enable a good cover of pasture to be kept on them all the year around.

Finally, a word on treatment. Affected calves should be immediately isolated, and if strong enough, should be starved for 24 hours and then fed a little and often. One pint of limewater to two pints of milk is often of benefit. Here again, it is essential that the milk be warmed to blood heat before feeding. Up to an ounce (two tablespoons) per day per calf of cod liver oil or a similar fish oil, has been found to be useful, and owners will probably benefit by feeding about half an ounce per day per calf to healthy calves as a prophylactic measure once the disease has manifested itself in a calf pen. Fish oils are rich in Vitamin A which builds up the mucous membranes of the body.

Medicinal treatment used to consist of drenching with substances such as bismuth carbonate which formed a protective coating over the inflamed mucous lining of the gut and so reduced straining on the part of the calf. This treatment, however, has been superseded by sulphonamide drugs of which Sulphaguanidine is the most commonly used at present and which is highly effective against most of the bacteria causing scours and is also of some use against Coccidiosis. However, a Veterinarian should always be consulted before these drugs are used, and it is also of advantage for a Veterinarian to inspect the pens and also, if possible, to carry out a post mortem examination on infected calves, since it enables a more definite diagnosis of one or more of the above forms, and special control measures may be necessary to suit local conditions. Most emphatically though, prevention is better than cure, as drugs are expensive and still nowhere near 100 per cent effective.

DEPARTMENTAL NOTES.

(Current Work.)

In view of the fact that the Annual Report of the Department for 1945 is not being printed in the *Journal*, it is considered desirable to provide a brief account of recent departmental activities. The following notes cover the period July to September, 1946, and it is hoped that they will prove of interest to local readers.

1. General Agricultural Station, Sigatoka.

With the closing down of the Nasinu Station which became effective as from 1st November, 1946, and in view of the necessity of the retrenchment of agricultural work at Sigatoka, it was decided in August that the General Experiment Station should be utilized during the interim period as a dual purpose farm. The aims of the new plan are to provide a holding station for (1) Departmental stock, (2) Crop varieties, pending development of (*a*) Main Headquarters Station, and (*b*) Dry-zone Station. There is also the longe-range probability that this station will be developed either as (1) an Animal Breeding Station or (2) a District Farm or (3) combination of (1) and (2).

Accordingly a plan was drawn up and approved as follows: (1) Layout—

(*a*) Northern Section—Agricultural crops;

(*b*) Southern and Central—Livestock.

It was decided to plant up all fields in the Southern and Central areas with pasture and fodder crops prior to the veterinary services taking over. This involved the removal of Cashew and other permanent crops and the sowing of fodder crops—Kavirondo sorghum (2 acres), Para grass (5 acres) and Blue grass (2 acres). A field of Elephant grass (5 acres) and a considerable area (9 acres) of para was already available, in addition to certain hill slopes where closures have enabled pastures to become re-established. With the exception of one small area of half an acre this programme was completed by, and the Veterinary Division took over as from the 1st October.

The Agricultural section is being used as follows:—

(*a*) production of stock foods and fodder (maize, roots, legumes, etc.);

(*b*) maintenance of crop varieties (cotton, Sorghum vars., tobacco, pulses, etc.);

(*c*) pasture composition studies (Research Project).

The programme in this area has involved the removal of avocado trees—the planting of maize, kumalas, and tapioca and the sowing of the legumes *Stylosanthes*, *Desmanthus*, *Pueraria* and *Centrosema*, all of which is well advanced. The Research Project involves a co-operative plan whereby the changes in the composition of pastures under grazing may be studied. The field used comprises (*a*) volunteer pasture of para and other species, (*b*) mixed para and blue grasses (the latter seed sown) and (*c*) mixed pasture (blue grass planted in drills).

Co-operation.—For the ensuing period the station will serve a dual purpose and will continue to be supervised by the Senior Veterinary Officer and Senior Agricultural Officer in consultation. The officer in charge on the station is a Veterinary Assistant with a Field Assistant in charge of crops.

Considerable reduction of labour and expenditure has been effected without jeopardising the present or future use of the Station.

General.—The Station will continue to distribute certain stock and plant materials; but nursery work will be reduced to a minimum, issues being limited to dwarf coconuts, budded citrus, maize and other seed.

2. Central Agricultural Station, Naduruloulou.

The following notes are compiled from the quarterly report of the station which, since July, has been supervised by a senior Field Assistant.

Pending development of the agricultural plan, the programme has been reduced to the maintenance of—

(*a*) permanent crops, coconuts, citrus and other fruit trees;
(*c*) model farm area (contour cropping and composting);
(*b*) selected crop varieties;
(*d*) student training;
(*e*) pastures;
(*f*) citrus budding and distribution.

Crops of interest included soya bean, sweet corn (U.S.D.A.34) Kavirondo sorghum (perennial grazing), niger seed (oil), woolly pyrol (pulse), adlay (cereal) and kumala (vars. Winnop, Black rock and Three months).

Vegetables which gave excellent results are: tomato (*Bonny Best* and *Tatura*), china cabbage, lettuce (*Mignonette*), french beans and cabbage. Citrus budding carried out by Fijian students was commenced during September with an average of 60 per cent successful buds. Budded citrus trees (172), Malayan dwarf coconut seedlings (131) and 4,174 lb of rice seed (7 varieties) were distributed.

A feature of the model farm is the stall feeding and bedding down of stock, associated with the production of pen manure from farm wastes, all the weeds and trash from cultivated areas being utilized.

Selected students, on completion of their courses (3 years) were retained as a pool of trained farm labour and from this group teams of workers were made available for weed control work, for soil surveys and for work in connexion with the establishment of the Teachers' Training College (Education Department).

3. Dobuilevu Farm, Ra.

Supervision of this farm continued in the hands of a senior Field Assistant. The programme has been maintained as follows:—

(*a*) rotation cropping on contour terraces;
(*b*) establishment of pasture and fodder crops;
(*c*) seed production and distribution;
(*d*) pen manure from farm wastes.

Crops.—Excellent crops of European vegetables were grown—viz. carrot, lettuce, tomatoes (*Tatura*, *Break o'day* and *Bonny best*), french beans and green peas. Other crops were soya bean, pigeon pea (improved strain), sunflower, maize and cowpea.

Guatemala and elephant grasses and the fodder legume, tropical kudzu, were established. Tree plots were maintained and new plantings established including Mahogany, W.I. Cedar; growth of "Yemane"(1), "Baumuri"(2) and mahogany has been very good.

A stock shelter was erected and progress made with the manufacture of farmyard manure.

Special project.—Good progress was made with banana spraying for the control of leaft spot disease and dusting with insecticides for control of scab moth (Gammexane, D.D.T., Derris compared with standard Pyrethrum).

Seed distributions were made of dwarf coconuts, maize, soya bean, cowpea.

1 *Gmelina arborea.* 2 *Securinega samoana* Croizat.

4. Field Extension Services.

Routine field advisory services were maintained but some reorganization in control was necessary on account of staff shortages. The following notes indicate the scope of the work undertaken during the period.

Soil conservation.—The contouring of hillsides at Wailoku Solomons Settlement was completed and a rotational cropping scheme laid down for future cultivation.

Two farms at the Indian settlement at Vunikavikaloa, Ra, were laid out in contours for cultivation of maize, pulses and pineapples.

Similar work was carried out at the Teachers' Training College where farm development is being carried out by the education authorities in consultation with the Department of Agriculture.

Weed control.—In the western districts of Viti Levu effective action was taken to control an infestation of giant sensitive plant at Nadi, Johnson grass at Sigatoka and Noogoora burr on Indian farms in Nadroga.

Field surveys were commenced as follows: Noxious weeds in Tailevu and Navua, peanut crops in Tailevu South and Rewa, potato crops in Nadroga, land development projects at Davuilevu and Nasinu, general agriculture and weeds in Kadavu.

Marketing.—Advisory services were rendered in connexion with the organization of the marketing of candlenuts, bananas, peanuts and maize. In the western districts Fijians collected 215 tons of candlenuts for sale to a local oil-mill, packed 732 cases of bananas for export and maintained normal supplies to local produce markets.

Weekly observations on price trends for agricultural produce at main centres were recorded—maize dropped from 42s. to 32s. per bag (3 bushels), local potatoes from £21 to £17 10s. 0d. per ton and tomatoes from 1s. to 2d. per pound. Pulses were in short supply and prices were high (6d. to 9d. per lb).

Food production.—For information purposes field officers reported regularly on the supply and production of local food crops, grains, roots, pulses and dairy products including ghee. Efforts were made to establish a market for and to encourage the cultivation of soya bean which was under trial for supplementary rations as a partial substitute for flour.

In Viti Levu and Vanua Levu emergency purchases of rice were continued with a view to building up reserve stocks. Altogether 237 tons rice and 154 tons padi were purchased. Assistance was given with the supply of rice for workers engaged in copra production in areas where rice is not grown.

Administratively the Department was actively concerned with many factors relating to the steadily increasing production of copra throughout the Colony.

5. Produce Inspection.

During the six months ending 30th November, the following produce was inspected by the Produce Inspection Staff:—

Exports.

	Inspected and shipped.	Fumigated and shipped.	Rejected.
Fruit	5,501,910 lb	414,840 lb	18,990 lb
Vegetables	4,260 „	..	....
Root crops	32,120 „	1,240 „	....
General produce (excluding flour, copra and sugar)	1,057,150 „	2,680 „	....
Plant matter	152 pkgs.	..	....

IMPORTS.

	Inspected and passed.	Fumigated and passed.	Rejected.
Fruit	153,142 lb	7,930 lb	....
Vegetables	969,152 „	....	....
Root crops	3,141,184 „	....	....
General produce (excluding flour, copra and sugar)	183,132 „	1,740 „	....
Plant matter	407 pkgs.	66 pkgs.	7 pkgs.

Approximate value: Exports, £F56,100; Imports, £F41,175.

The general quality of both incoming and outgoing produce was good, with a marked improvement in pack and quality of bananas.

The above list does not include copra, of which 214,723 sacks were inspected and graded during the period.

6. VETERINARY SERVICES.

Stations.—The Nasinu Stock Farm was closed and work previously carried out there was continued at Sigatoka Farm which is now predominantly a stock farm.

The Red Poll herd at Nasinu has been handed over to the Industrial School as a source of school milk and for training purposes. The new establishment at Sigatoka includes a herd of Holstein-Friesians with which experimental work on nutrition is being carried out.

Pigs, both Whites and Tamworths, are established at Sigatoka as well as a carefully selected flock of Australorps and a smaller flock of Rhode Island Reds.

From the poultry and pig sections numerous sales of breeding stock have been made to the public, the most important being the distribution of a large number of day-old chicks.

Field Work.—Livestock inspection: from stations at Suva, Naduruloulou, Ba, Nadi, and Labasa, officers of the division have continued with routine stock inspections, carrying out, in the course of their duties the provisions of the Animal Improvement and Contagious Diseases Ordinance. The disease position generally is very much improved, and apart from a general overall small percentage of tuberculosis there was little else of significance. The animal improvement position is, however, not in such a good position. Although more unwanted bulls are being dealt with than ever before there still remains a vast number roaming the Colony, often unowned or unclaimed.

Brands have been taken out to the total number of 5,000 and officers have been concentrating on the actual branding of stock as well as the issuing of certificates.

Ringworm control: the position improved considerably particularly in that area which has always been the worst, the Ba–Tavua area. Musters were carried out in several areas but in view of the improved position these were discontinued on the grounds that they may serve as a source of spread of the disease, rather than a source of control. A visit to Kanacea and Naitauba by the Senior Veterinary Officer disclosed that the disease was present on these two islands.

Dairies inspection: the application of the Dairies Regulations was placed in the hands of the Division and already visits have been paid to most of the registered dairies of the Colony. Conditions in some were found to be below standard requirements and instructions were issued for their improvement. The hygiene position in dairies supplying milk to Suva town was maintained at its usual high standard.

Tuberculin testing: this work took up a great deal of time of the qualified staff. The tuberculosis position in cattle which have been tested previously was particularly good. No new herds have been brought into the scheme owing to lack of staff.

Fisheries: general observations on fisheries were made and assistance rendered to fishermen in marketing whenever time would allow.

7. Economic Botany.

On account of the lack of staff and facilities the programme of this section was limited to the practical aspects of the following projects:—

(*a*) weed control experiments (4 projects);
(*b*) pasture establishment and grazing trials (2 projects);
(*c*) fodder plants—introduction and trial;
(*d*) plant introduction and distribution;
(*e*) routine identifications;
(*f*) plant protection services (inspection, quarantine and control of plant diseases);
(*g*) arboretum and herbarium.

Weed control trials have been undertaken according to plan at Ba, Vatia, Yaqara, Tailevu, Naduruloulou, Samabula and elsewhere. Objects of the work are to test the economics and efficacy of the use of Agroxone (Methoxone) and Dinoc for control of Noogoora Burr, Paddy's lucerne(1), Solanum, Hibiscus burr, Tobacco weed, water hyacinth, guava and nut grass principally and also a number of incidental weeds of pasture land. Good progress has been achieved and arrangements have been made to procure the following additional weedicides—Weedone, Weedex, Phenoxyl, Denoc and Denocate. Pasture work has been continued at Tailevu, Naduruloulou and Sigatoka. Preliminary grazing trials have given indications of palatability of certain legumes and their reaction to grazing. This work is being developed in co-operation with farmers.

Productivity in terms of green and dry yields of test plots has been studied in the case of four legumes and five grasses; and their use as fodder studied.

The botanical composition of different types of local pastures has been recorded and factors affecting weed infestation of grazing land investigated.

Experiments on the improvement of local playing greens have been commenced.

Fodder plants.—Recent introductions include Korean lespedeza(2), white and red clovers, Lotus major, subterranean clover(3), Hop trefoil(4), and Haresfoot trefoil(5).

Good progress has been made with the establishment of trial plots of woolly finger grass(6), Guatemala grass, Paspalum or summer grass, Elephant grass (improved strain) and numerous strains of Dicanthium blue grass. These will form the basis of selection work later. This work has been pushed to the limit of available land under the supervision of one Field Assistant with very satisfactory results.

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1 *Sida acuta* Burm.
2 *Lespedeza sericea* Benth.
3 *Trifolium subterraneum* L.
4 *T. procumbens* L.
5 *T. arvense* L.
6 *Digitaria melangiana.*

Plant introduction and distribution.

Nursery propagation—	*Sown.*	*Issued.*
Plants	1,433	2,302
Cuttings	1,241	2,220
Seeds	876lb	55 lb

Interesting introductions include tomato (Pearl Harbour, disease resistant var.), Ivory nut(1), Nali nut(2), Eucalyptus (2 species).

Considerable quantities of plant material have been issued for amenity plantings throughout the Colony.

Routine identifications of plant material and disease organisms numbered 71.

A local plant protection service was organized enabling advisory work to be followed up by active assistance with spraying, equipment, fungicides and insecticides.

Current procedure relating to the importation of plants was revised and the routine inspection of imported produce and plant material undertaken. This work involves the analysis of samples of seeds, straw, etc., enabling proper precautions to be taken to prevent accidental introduction of crop diseases or weeds.

The arboretum at Naduruloulou has become an important asset to the Department. It now contains specimens of many indigenous and exotic fruit and timber trees, some of which are a useful source of seed for further planting.

With the closing of the Waimaro station in July it was decided to fell some of the albizzia(3) trees planted in 1938. Seven of these were converted into case timber from which 205 banana cases were made. These have been utilized for experimental purposes.

Specimens were added to the herbarium: but little work was possible on the collections which have been maintained with some difficulty. Special attention has been given to the collection of weeds, weed seeds and grasses.

8. Chemistry.

Owing to the existing staff limitations, work in the laboratory has continued to be confined to analyses for Government departments, private individuals and firms, research projects being out of the question in the meantime.

Since the departure to Australia early this year of the European laboratory assistant, who was awarded a Nuffield scholarship, the Acting Senior Chemist has had to carry on without this valuable assistance and consequently much of his time is spent in performing duties which should more properly be delegated to subordinate staff. This has resulted in unavoidable delays on occasions in the presentation of reports and, particularly as regards gold assaying, has caused some inconvenience. Until the staff situation improves, however, this will continue.

The following summary of the samples received over the last three months indicates the nature of the work performed in the laboratory. A total of 121 samples were received for analysis and included: foodstuffs, 37; liquors, 1; waters, 4; drugs, 8; hydrocarbon oils, 5; toxicological, 2; fertilisers, 3; mineral samples for gold assay, 16; gold bullion, 2; copra, 8; coconut meal, 18; soils, 3; agricultural miscellaneous, 7; and miscellaneous (cattle dips, etc.), 7.

1 *Metroxylon salononense.*
2 *Canarium mehenbethene.*
3 *Albizzia falcata* (Linn.) Backer.

9. Entomology.

In the absence of the Entomologist on leave the routine work of the Laboratory has been carried on by three laboratory assistants who have done useful work on the breeding and liberation of beneficial insects, the identification of crop pests and advisory work in the field in connexion therewith.

One research project has been undertaken in collaboration with the Station Services, viz.: banana dusting trials for control of scab moth. Interesting records of crop pests include the spathe borer(1), causing extensive damage to coconut leaf petioles at Draiba, Suva: and an unidentified moth pupating under the dead bark of pawpaw, a new record for Fiji.

The distribution of useful insects included two consignments of thrips for control of Köster's Curse, one of dung beetles(2) to Canberra and one of house fly parasites(3) to Labasa.

House and fruit fly parasites were bred, a total number of 20,740 being liberated.

Sixty toads(4) were sent to the Medical School, Dunedin, for research purposes.

10. Library and Propaganda Services.

This work was reorganized. Attention has been given to the indexing and classification of all books and periodicals in the main and divisional libraries—summaries of statistical information have been made and propaganda articles prepared in collaboration with the Public Relations Officer covering the following subjects—plant and import regulations, rice production, copra grading, weedicide trials, marketing of bananas, peanuts and other produce.

The mailing and exchange lists have been revised and important accessions to the library received from overseas institutions. The present distribution of the *Agricultural Journal* is approximately as follows (excluding official requirements)—local farmers, schools and general public 180, overseas exchanges 260.

The present form of the *Agricultural Journal* is receiving attention and it is hoped to introduce, with the first issue in the new year, some alterations and improvements, possibly including certain illustrations and photographs.

11. Conferences and Committees.

Meetings of the Research and Extension Committees were held and programmes of work arranged covering the following aspects of the Department's work—Veterinary, Agricultural, Botanical and Entomological research projects—Agricultural and Livestock extension projects. Officers of the Department were closely associated with the work of the Banana Board, the Copra Board, the Committee on Co-operative Legislation and Special Committee on Agricultural Development.

DDT IMPREGNATED FABRICS v. INSECTS.

By impregnating sacks with DDT the pests which normally infest grain can be practically controlled, according to experiments by Hayhurst (J. Soc. Chem. Ind. 1945, 64, p. 296).

In the author's experiments sacks of hessian and twill were treated with three types of DDT—namely, aqueous DDT emulsion, DDT in white spirit and DDT and coumarone resin in white spirit. Grain experimented on was wheat and national flour.

DDT in white spirit was found to be most effective and DDT and coumarone resin in white spirit least effective.

—"Manufacturing Chemist"—Vol. XVII, No. 5, p. 202, May 1946.

1 *Acritocera negligens* Butl.
2 *Pachylister chinensis* Qens.
3 *Melittobia* (*Syntomosphyrum*) *indicum* Silv.
4 *Bufo marinus* L.

AGRICULTURAL NOTES.

1. AGRICULTURAL TRAINING SCHEME.

SINCE 1932, the Department of Agriculture has maintained a scheme for the training of Fijian and Indian youths in the practice of agriculture. Initially the aim was to train selected youths for appointment to the field services of the Department, but latterly the majority of trainees have been admitted with a view to learning approved methods of farming for their own benefit.

The first five students were enrolled at Central Agricultural Station, Naduruloulou, in 1932; and in 1940 provision was also made at General Experiment Station, Sigatoka, to train 21 students annually. At Naduruloulou since 1940 a subsidiary scheme undertaken at the request of Provincial Councils and financed by annual grants to cover costs of rations, allowances and clothing, has been maintained, catering for a total of 42 students.

During the period of 14 years a total of 244 students has passed through the Departmental stations, the original course of two years being extended to three years in 1942, with the added provision of a bonus to successful students who completed satisfactorily.

Of the total trained, 31 at present occupy posts in the agricultural, veterinary, chemical, botanical, entomological and clerical services of the Department; the remainder have either joined other Departments of Government (e.g. 10 to Forestry, 11 to Fijian Affairs) or have returned home to farm their own lands. Several saw overseas service in the military forces during the war.

During the period of training these men have participated in a wide range of agricultural activities—they have learned to plough and cultivate the land, to maintain soil fertility by crop rotation, green manuring and composting; they have been instructed in the care and handling of animals, the making of pen-manure, the rearing of pigs and poultry and in the necessary tasks of fencing, draining and contouring. The latter item has been a special feature of the work, including strip and terrace cropping, contour planting and draining and afforestation of steep hillsides.

All varieties of crop plants have been handled from seed to harvest, pruning and budding and general nursery work and plant protection methods of pest and disease control have been constantly practised and demonstrated. The processing, grading and packing of fruits and other produce has been an important part of the training, so that, at least, these men have gone out with a basic personal experience of the problems, methods and expectations of a farming career.

In accordance with the recommendations of the Shephard Report(1) and the Report of the Special Committee(2), the admission of youths was discontinued in 1944 and the scheme ceases early in 1947 when the last groups of students complete their terms.

The present note records not only the cessation of a service which has proved its value in terms of trained personnel for technical services and farming life generally, but also the uniformly good conduct and conscientious effort of the youths selected during the whole period. These boys, whether recruited from Queen Victoria School, from Provincial Schools or direct from District Schools on the nomination of head teachers or local native authorities have, generally speaking, been most conscientious and willing workers, despite the fact that under the circumstances, the training was, as indicated above, essentially practical with a minimum of indoor teaching or lectures.

It is anticipated that provision will be made for the agricultural training of youths to be continued under the Department of Education. —B.E.V.P.

(1) Shephard, C. Y. 1944.—Report on Agricultural Policy for Fiji and the Western Pacific High Commission Territories. C.P. 24/1944.
(2) 1945—Report of Special Committee. C.P. 11/1945.

2. NEW FODDER CROPS FOR FIJI.

Perennial Kavirondo Sorghum.

Amongst the seeds brought to Fiji by Professor Paterson in August 1945 were those of *Kavirondo Sorghum.* As this plant has made excellent growth and shows great promise as an extremely useful addition to local fodder plants, the following notes are recorded.

This variety of *Sorghum* is a comparatively new one to world agriculture. It originated in Kenya in 1935 where the seed of a single plant of a type very similar in appearance to Sudan grass* was obtained from Maseno in the central Kavirondo area. Specimens were collected for propagation and identification; the authorities at Kew suggested that the plant was a natural hybrid between a native cultivated *Sorghum* and a wild species† common in Kenya.

The preliminary trial by the Department of Agriculture, Kenya, showed that the plant is a perennial of considerable duration (plants over five years old exhibit no obvious diminution in yield), that a heavy seed crop is produced and that establishment from seed is exceptionally easy. Locally, the latter two characteristics already have been demonstrated and the yield of palatable green material is very good.

The following statement shows the production under field conditions at Naduruloulou as compared with that recorded in Kenya:—

	Kenya.	*Fiji.*
Average yield per acre (tons) . .	18 weeks after sowing, 15·75.	18 weeks after sowing, 11·5.

An important feature of Kavirondo sorghum is its perennial habit which enables it to be used in mixed farming not only as a fodder crop but also for grazing purposes for which it has proved very suitable.

As is well known most sorghums develop cyanogenetic properties which render them suspect as cattle fodder under certain conditions of growth and climate. In the Kenya trials recorded by Edwards(1), aftermath grazing was carried out under climatic and growth conditions considered ideal for the development of the poisonous properties; but with no ill effects so far as the health of the animals was concerned. It was concluded that the development of toxic properties in this crop is " extremely improbable and that this remote possibility need not stand in the way of its extensive use ". No ill-effects on stock when fed solely on this fodder have been noted locally.

The crop has shown marked drought-resistant properties and owing to its easy propagation from seed, is considered to be most suitable for combined use as fodder and as a temporary grazing ley in rotation with cash and food crops in the dry areas of the Colony.

Its establishment at Sigatoka and Dobuilevu, Ra, is being proceeded with and a limited amount of seed is available for distribution to farmers interested. The recommended seed rate is 20 pounds per acre sown in drills two feet apart. —B.E.V.P.

REFERENCES.

(1) Edwards, D.C. (1941)—"A New Fodder Crop ", East African *Agricultural Journal*, Vol. 4, No. 4, p.183.

* *Sorghum sudanense* Stapf.
† *Sorghum verticilliflorum* Stapf.

3. QUEENSLAND BLUE GRASS.

On Mr. N. S. Chalmers' property at Vatia Point, Ba, there is a good example of the establishment of blue grass. Mr. Chalmers reports that some eight years ago he imported from Australia a quantity of blue grass seed which was scattered around in the paddocks with no previous preparation. An excellent " strike " was obtained.

Since then Mr. Chalmers has used his own seed to sow down further areas of pasture. His method is as follows: Just after the grass has flowered and the seed set, it is cut with a hay mower. The grass is carried off on sledges and scattered over the new land, the seed drops out of the heads and so becomes established. Mr. Chalmers considers by using this method he can obtain a good stand in three to four years.

In June of this year pure stands of blue grass up to five feet high were observed. The grass had competed with other grasses and had practically eliminated weeds.

In 1945, having a surplus of fodder, a quantity of this grass was cut for meadow hay. This was later fed to the dairy herd and was readily eaten by them.

At the General Experiment Station, Sigatoka, in June 1945, a field of blue grass was sown down. The method adopted was to disc harrow the field twice, which was under a grass fallow, then scatter the blue grass heads and harrow again. Nothing was seen for some months; but twelve months later a fifty *per centum* stand was the result. It is hoped that within another twelve months the stand will be well established.

Another method tried in December 1945 at the same Station was to plant roots of blue grass in rows about three feet apart. This field was under bare fallow. Cultivation of the rows was continued until the runners became too long. By June 1946 a good stand had resulted.

If a farmer desires a good stand quickly, this latter method is the best. Although more labour is required and it is more expensive, the blue grass has not the competitive weed growth to contend with while it is becoming established.

The blue grass planted at the General Experiment Station was that of the " naked " node type, while that used by Mr. Chalmers at Vatia was the " tufted " node. —C.R.V.

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4. LOCAL FIBRE FOR ROPES.

Indian peasant farmers in the Sigatoka valley and around Nadi, Lautoka and Ba plant a small area of Patwa* each year, the fibre being used for their own needs. This is a practice of long standing and has not sprung up over the war years, though more have gone in for growing this crop during the last few years. Only small areas are planted, not more than half a square chain each. Even when commercially-made rope was scarce there does not seem to have been any increase in the area planted by each man, with the idea of selling rope made from the fibre.

In comparison with commercial rope made from sisal, patwa rope does not show up very well. Local farmers tell us that a good patwa rope in wet weather, being used as plough reins or tethering, will last about two months; whereas sisal rope, under similar conditions, will last about three and a half months.

It is estimated that it would cost about 1½ pence per pound of fibre to produce. A rope maker would make about 50 feet of rope per day and would use some four to five pounds of fibre to make that length.

	s.	d.
Cost of material	0	6
Labour on day	4	6
	5	0

The quantity of rope produced would then be four pounds, costing 1s. 3d. per pound. Factory-made rope is now selling at 1s. 6d. per pound.

From the above it would appear that there is little chance of a peasant industry being established. The selling price of the locally made article would need to be very much lower than the price for sisal rope, approximately half, to offset the short life of the local product. —C.R.V.

* *Hibscus sabdariffa* var. *altissimus.*

5. PRODUCE.

SUPPLIES of Fijian foodstuffs have been sufficient to meet local requirements. Maize has been in very short supply with resultant high prices. The rice harvest has been most satisfactory, yields being sufficient to obviate the necessity of any importation from overseas. Pulses, however, are still not produced in sufficient quantity to meet full local requirements. The first Sigatoka potatoes were marketed in late July, the crop being of good quality and larger than in recent years.

For the export market bananas have been coming forward in sufficient quantity to fill quotas allotted, while the damage effected by the floods early this year has been largely repaired by the replanting of plantations. There has been an export boom in peanuts at enhanced prices with the result that considerable new plantings have been made. A demand for green ginger from both New Zealand and Australia has been met as far as local plantings have permitted while rice bran as a stock feed is in urgent demand in New Zealand.

The following list shows the quantities of produce, other than copra and sugar, shipped overseas for the period June 1st to November 30th, 1946, the value of which was £F56,100 approximately.

Bananas	39,765	cases.
Pineapples	6,914	,,
Mixed fruit	234	,,
Oranges	3	,,
Cucumbers	115	,,
Mixed vegetables	44	,,
Taro	174	,,
Yams	50	,,
Arrowroot	53	sacks.
Coconuts	204	,,
Coconut meal	10,575	,,
Green ginger	1,590	,,
Peanuts	2,295	,,
Rice bran	3,306	,,
Candle nuts	482	,,
Candle nut meal	21	,,
Water melons	1,493	only.

—R.A.K.

6. PEANUTS FOR EXPORT TO NEW ZEALAND.

In view of the present demand and high prices for peanuts exported to New Zealand, the Director of Agriculture addressed some questions to the Director, Internal Marketing Division, for the purpose of securing information which would be of benefit to producers in Fiji as well as exporters. The following replies have now been received:—

(1) The types preferred are the large dessert variety, there being a poor demand for the small types.

(2) Present demand is steady.

(3) It is most unlikely that prices will remain at the present high level.

Prior to the war New Zealand imported the bulk of its requirements from China. The wholesale price in Auckland of these nuts was then under 4d. per lb. South Africa is also a likely competitor.

(4) In prewar years supplies were received from Ceylon, India, Malaya, China, Japan, Netherlands East Indies, United States of America and Manchukuo. From 1936 to 1939 the annual total of shelled and unshelled nuts landed in New Zealand varied from approximately 1,752,000 lb to 2,630,000 lb.

(5) Present prices are definitely boom prices.

(6) The most recent decision concerning the restrictions on the importation of peanuts into New Zealand concerns peanut licences and is as follows:—

> "Amendment No. 207 Tariff Item Ex 52 (1) 15/5/46. It has been decided that licences will be granted for the importation of peanuts from Fiji to the extent of 50 per cent of the 1942 licences granted for imports of such goods from all sources."

From the foregoing, growers of peanuts will see that the period of high prices for such produce is indefinite, that the present period is a " boom " period and therefore their planting programme should be set accordingly.

They should realize that as soon as other competitors for the New Zealand market enter the field, variety and quality will decide whether they retain the market now available to them. Obviously, then, growers should see to it that when harvesting and bagging their crops the nuts are fully mature, clean and free from trash, soil, stones, etc., and that all shells are full and well graded. —H.R.S.

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7. COPRA IN LAU.

During a recent tour opportunity was taken to examine copra at Naitauba and at Kanacea in the Lau group. The quality of the copra was variable, that having been stored for some time being rather poor though recently cured copra appeared quite good. In neither place were driers being used. A little planting was being done but most of the trees appeared to be very old.

Naitauba was exceptionally free from weed undergrowth but Kanacea appeared to be heavily infested and in the case of guava a method was being used whereby the branches are lopped causing each tree to grow tall and thin.

In both places there seemed to be adequate labour available. They appeared satisfied; their quarters are good and their vegetable gardens were planted, the main crops being tapioca and yams. There was no dalo, however, few bananas and not much of other fruits. —H.T.B.H.

8. MURAINA GRASS IN RICE FIELDS.

During the past few years damage to rice crops by muraina grass has greatly increased. In the course of recent inspections of rice cultivated by Indian farmers who do not grow sugar cane in the districts of Waidaleci, Korovou, Sawakasa, Lodoni, Dawasamu, Vunidawa in Tailevu and Naitasiri provinces and from Vunikavikaloa to Yaqara in Ra, muraina grass was found to be present in all areas but is worse at Vunikavikaloa than anywhere else.

In order to control and eradicate muraina grass from the rice fields farmers should take care of their land throughout the year and plough in a suitable way and prepare well for each crop. Practical work has shown how this grass can be controlled and farmers can always obtain advice from the Agricultural Officers or Field Assistants nearest to them.

Preparation of the Land.

Thorough preparation of the land is very necessary. After the rice crop is harvested the land should be ploughed immediately to a depth of four to six inches and left until the muraina seeds germinate. When the grass is four to five inches high cattle should be put in the fields to graze for about two months. At the end of that time the field can be harrowed and ploughed again twice so that the growth of the muraina grass during the dry and fallow season is held in check and many seedlings destroyed.

Preparation of Seed Padi.

Padi intended for sowing the next season should be carefully cut by hand before the crop is harvested—selecting the best heads of the pure variety. This padi is carefully dried and stored for seed—with care it can be gathered from the field free from muraina grass.

If this method of obtaining clean seed is not possible the farmer can have his seed padi cleaned by machine free of cost. The Department of Agriculture has a winnowing machine at Dobuilevu and at Naduruloulou which separates the padi cleanly and removes the muraina seed and dirt. For this to be done well it is necessary that the seed be thoroughly dried before cleaning.

Seed Beds.

Much care must be taken in preparing the seed bed which should be placed in a part of the land where there has been no muraina grass. It is useless sowing clean seed in land full of muraina grass and if the seed bed is full of the weed it will be transplanted out into the field and cause the crop to be a poor one.

It is not easy to control this weed but the farmer must do everything he can to keep it from spreading in his land and if he carries out the work described above regularly each year he will find that his yield of rice is much improved.

—M. Haripal.

STAFF.

News has been received of the transfer on promotion to the Malayan Agricultural Service of Mr. R. J. A. W. Lever, B.Sc. (Hons.) D.I.C., A.I.C.T.A., F.L.S., lately Entomologist Fiji and for many years Editor of this *Journal*. Mr. Lever's service in the Pacific covered a period of 15 years during which time he published a large number of articles on the economic insects of the B.S.I.P. and Fi i.

VETERINARY NOTES.

By H. T. B. HALL, B.V.Sc., Acting Senior Veterinary Officer.

1. THE BULL PADDOCK.

It is seldom indeed that one sees a bull paddock being used in Fiji. Most farmers will say that cows here do not show heat sufficiently for it to be seen, and that if the first or second heat period is missed the cow is likely to fail to get in calf at all.

Experience over the last two years at Nasinu Farm where the bull paddock has been in constant use indicates that with close observation cows can be brought to the bull at the right time and that they can be got in calf mostly at the first mating. Occasionally they miss and must be mated a second time. It must be stressed that close observation is necessary as it appears that the heat period, or rather the period during which conception will occur is shorter than with cattle in more temperate climates.

The advantages to be gained are obvious. Firstly, the bull is not worn out too early, that is, his useful life is lengthened and secondly, the time of calving can be so adjusted that production is greatest during the flush of feed.

With the few cows at Nasinu which missed the first and second heat period there was no evidence that they failed to get in calf subsequently. In each case pregnancy occurred.

2. COD LIVER OIL FOR PIGS.

Experience at Nasinu has shown that Cod Liver Oil fed from weaning to butcher has a marked effect on growth rate and bloom.

A teaspoonful per pig per day has proved to be sufficient using crude Cod Liver Oil. This works out at about 5s. for each pig for the whole period until it goes to the butcher.

Pig farmers would do well to obtain some crude Cod Liver Oil which is available at the present time and feed this amount.

3. CANDLENUT CAKE.

The following is a brief account of an experiment carried out at Nasinu on candlenut cake.

On 2nd July one cow and one pig commenced receiving the ration in the place of the usual coconut meal.

The cow commenced with 1 lb daily, quickly raised to 2 lb daily and then gradually raised to 4 lb daily. The ration was fed with rice bran and molasses until the 7th September.

Apart from not relishing the meal for some time no difference could be noted between this cow and other cows fed with coconut meal. There was no sign of scouring and no sign of any toxic effect. The cow appeared to do well.

The pig was fed on half the ration given to the cow with the addition in this case of roots and slaughterhouse offal as well as rice bran and molasses. The results were the same, that is, there was no scouring and no untoward toxic effect. The pig appeared to relish the meal after the first few days and put on weight at the same rate as other pigs fed coconut meal.

KUDZU.

KUDZU[1], was brought to the United States from East Asia about 70 years ago. It had not been used as an economic farm crop until recently. It is now recognized as a valuable plant for forage, improving the soil, and for controlling erosion.

For forage purposes, Kudzu makes excellent hay and a good pasture. The hay is palatable, cures easily, and retains its leaves well. Average good hay consists of about 50 per cent leaf. About two hay cuttings a year are all that can be expected. The hay cures rapidly, so it is not necessary to leave shooks of hay exposed to weather for any considerable length of time. Good stands commonly yield three-fourths to one ton of hay per acre at each cutting.

Kudzu is well adapted for heavy temporary grazing, for short or rotation grazing with alternating periods of rest. When grazed continuously from May 1 to October 1 at the rate of one cow per acre, the 8-year average gain in beef per acre has been 243 pounds.

During the past two years, Hairy Vetch has been planted broadcast on Kudzu and allowed to reseed with good results. These crops seem to grow well in combination and the Hairy Vetch helps prevent loss of plant food by leaching during the winter. Kudzu is a warm-weather plant.

Few seeds, however, are produced in this country, so that most of the propagation at present is by crowns. Vines take root readily when allowed to run along the ground, and transplanting material may be easily secured from this source. It grows well on a wide variety of soil types, but best growth occurs on well drained loam soils of good fertility. It can be established on poor, eroded soils by the use of fertilizer and stable manure. Kudzu will not do well on deep sandy soils or soils that are poorly drained.

Kudzu responds to superphosphate and potash on Coastal Plain soils. To hasten establishment of new plantings it is also highly desirable to use stable manure if available, especially on soils low in organic matter.

Crowns should be set when dormant or during the winter months. Transplantings made after active growth starts usually result in a poor stand.

In transplanting, it is important to protect crowns from drying. Holes or furrows should be deep enough to allow roots to spread out full length, the crown bud placed about level with the surface of the ground, and the soil firmly packed about the roots.

If it is desirable to have the ground covered quickly to prevent erosion or to produce hay and grazing, spacing of plants should be closer than when time for establishing is of less importance. Plants set in 8 to 10 foot rows and 8 to 10 feet apart in the drill, under favourable conditions, can give complete cover within two years.

Cultivation is necessary the first year to keep down weeds and grasses until plants become established. Vines can be encouraged to take root by covering at intervals with a shovelful of soil.

Kudzu should never be cut or grazed during the first year and only lightly, if at all during the second year, because it is very important to get the plants well established. Frequent cutting or close grazing should never be practised.

1 *Pueraria thunbergiana.*

[From "Georgia Coastal Plain Experiment Station, Tifton, Georgia" Mimeograph Paper No. 37, 27th January, 1945.]

REVIEW.

PLANT BREEDING IN THE U.S.S.R.

DURING the past decade Russian scientists have carried out a great deal of research work, much of which has not been accessible outside the confines of the U.S.S.R. In the realm of plant breeding, work has been extremely active; and during the period since 1930, there has been much conjecture and not a little controversy regarding the genetical theories advanced by prominent Russian botanists.

The Bulletin* here reviewed has been written with the intention of evaluating the contributions of the Russian non-Medelian genetical school and of describing for English readers its characteristic theories.

Based on the original Russian scientific literature, much of which has only recently become available, the Bulletin deals with the history, psychology, evidence and interpretation of genetical theories as advanced by the most prominent school of genetics led by the Ukrainian botanist Lysenko.

There have been many criticisms of the views of this group of scientists and the authors of the Bulletin have not only provided a deeply interesting and detailed analysis of the published data but have given a very necessary explanation of the background of the new theories which have been advanced.

There are included excellent brief biographies of plant breeder Micurin who developed the theory that the environment has a profound effect on F1 hybrid seedlings, and of Lysenko who earned world fame for his theory of phasic development and his work on the practical technique of vernalisation.

It was Lysenko who in 1935 set out to substitute his theory of phasic development for the classical Mendelian theory of genetics, who denounced the chromosome theory of heredity and later developed the nutrient theory of genetics. These views have precipitated a heated controversy; but with official support, Lysenko became a dominant factor in Russian plant breeding circles; and he is " undoubtedly one of the best-known figures in Russia to-day and his prestige among collective and state farm workers appears to be immense ".

The Bulletin serves a very valuable purpose—it presents the evidence impartially, throws light on the extraordinary mixture of logical reasoning and speculation which is distinctive of Russian scientific literature. The procedure is described as " alogical, i.e. it derives its conclusions not by logical argument from the facts but by appeal to chosen authorities, by condemning views in opposition to these authorities, by analysing the presumed states of mind of its opponents and by estimating the value of theories by their agronomic usefulness ".

It is impossible in the limits of space available for this review to deal adequately with this well-produced bulletin which contains much that is of immediate interest, not only to geneticists and professional scientific workers but also to the general reader.

There is a very excellent summary (in five languages) in which are listed the facts reported in support of the new system of Lysenko and his colleagues —and an explanation of the nutrient theory advanced to cover these presumed facts. The publication is recommended to readers as a valuable contribution to our knowledge of a remarkable development in human affairs and reasoning, and for its clarity of expression and excellent, careful and unbiased presentation of the facts and its sound criticisms of the discrepancies and weakness in the theories, which it is recorded, receive only slight support from the facts.

—B.E.V.P.

*_The New Genetics in the Soviet Union_ by P. S. Hudson and R. H. Richens, Imperial Bureau of Plant Breeding and Genetics, Cambridge 1 May, 1946, 88 pages. Price 6s.

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